UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,624	10/27/2003	Philip L. Cole	COPL:002US	2611

32425 7590 11/20/2007
FULBRIGHT & JAWORSKI L.L.P.
600 CONGRESS AVE.
SUITE 2400
AUSTIN, TX 78701

EXAMINER	
DUDNIKOV, VADIM	

ART UNIT	PAPER NUMBER
3663	

MAIL DATE	DELIVERY MODE
11/20/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/694,624	COLE, PHILIP L.	
	Examiner	Art Unit	
	Vadim Dudnikov	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 9-33* is/are pending in the application.

4a) Of the above claim(s) *4,5 and 10-27* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6,7,9 and 28-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/22/06;1/16/04*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments see pages 9-14, filed 09/07/2007, with respect to the previous Office action have been fully considered but are not fully persuasive.

Those rejections that have been overcome by amendment are omitted from the current Office Action and are to be considered withdrawn.

The amendments to specification, to claims 1, 2, 9, 29, canceling of claim 8 and adding of claims 31-33 are acknowledged. Claims 1-3, 6, 7, 9 and 28-33 have been examined.

Regarding claim rejection under 35 U.S.C. 112:

Applicant's detection system consisting of three detectors cannot detect continuous spectrum as shown in Fig. 6. Said detection system can detect only the mean number of X-rays counts in every of three energy ranges. Applicant can have only three points on this spectrum: one point for low Z; one point for PPAD; one point for high Z. Applicant can calculate ratio of said counts detected with "cargo container 125" Na and the number of counts without "cargo container 125" Nb similar as disclosed by Naele et al.. Detection by disclosed detection system of a photon's energy spectrum in energy range from about1 MeV to about 50 MeV with resolution as shown in Fig. 6 is not disclosed in specification. In Fig. 6 is shown a simulated photon energy distribution (Specification [0041]). Applicant's argument are not persuasive because "detecting an emerging photon beam within an energy range from about 1 MeV to about 50 MeV is

not disclosed in specification. Claims rejections under 35 U.S.C. § 112 first paragraph is not withdrawn.

Applicant's subject matter of invention are a method for identifying the presence of substances concealed in closed container by detection of level of attenuation of high energy X-rays transmitted through the container. Said method represents a common knowledge in art of the X-ray interaction with the matter and a X-rays registration as detailed in the cited prior art.

The claimed method would have been obvious because a person of ordinary skill has good reason to pursue the known options within his her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. The alleged distinction between the claimed "method of remote detection of materials of varying atomic numbers" of the invention and cited prior art does not correspond to any non-obvious claimed limitation.

Applicant's arguments regarded to the claims rejection under 35 U.S.C. §103 are based on the amended claim language and will be answered in rejection to the amended claims.

Rejections of amended claims are established in light of further consideration and search of the prior Art. See rejections underneath.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim **1-3, 6, 7, 9 and 28-33** rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Limitation "detecting an emerging photon beam within an energy **range from about 1 MeV to about 50 MeV** from the fissile material with an array of fission-fragment detectors, a first set of scintillator paddles, and a second set of scintillator paddles" claim 1, lines 4-8, introduces a new matter, because it is not disclosed in specification, as sanded.

Claims **2, 3, 6, 7, 9** and **28-33** are rejected as depended of rejected claim 1.

Claim rejections – 35 USC § 103

4. The following is a quotation of USC 103 (a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary

skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims **1-3, 6, 7, 9,** and **28-33** are rejected under 35 U.S.C. 103(a) as being unpatentable over Neale et al. (U.S. Patent # 5,524,133) in view of Gunther et al, ("Applicability of a simple parallel plate avalanche detector to photofission experiments", Nucl. Instrum. And Mhetods, 163, 459-461, 1979) and in view of Groom ("Photon and electron interaction with matter", LBNL, 1998, p. 152, 153).

Considering independent Claim **1** Neale teaches (Title, Abstract, FIG. 2, FIG. 3, FIG. 4, column 1, lines 16-67, column 2, lines 1-67): "A method for identifying a fissile material (subjecting the material to high energy X-rays and determining the **mean number** Na of X-rays transmitted through a region thereof, in title, abstract, column 1, lines 18-67), comprising: casting an incident photon beam (**18** in FIG. 4) from an electron beam accelerator (**10** in FIG.4) on the fissile material (**12** in FIG. 3); detecting an emerging photon beam within an energy range from about 1 MeV to about 50 MeV from the fissile material with an array of energy sensitive detectors (**22** in FIG. 4), herein the array of energy sensitive detectors are sensitive to different ranges of photon beam energy (as shown in Fig. 3); <u>obtaining signals from detectors sensitive to different ranges of X-rays energy, each signal indicative of photon yield within the different ranges of photon beam energy (as shown in Fig. 3; column 3, lines 44+); and</u> determining a photon energy regime of the emerging photon beam <u>through identification of a drop in photon yield (photon attenuation) in at least one of the three (several)</u>

signals (column 3, lines 44+), the determined photon energy regime identifying the fissile material (detection and procession systems in Fig. 12, 13; column 3, lines 44+). (Material **discrimination** arises from the energy dependence of the transmission coefficient being different for different materials. The transmitted X-rays are detected by **pairs of crystals** placed one behind the other the **front crystal** being sensitive to lower energy X-rays while the **rear crystal** is sensitive to higher energy X-rays. Good discrimination is possible at low X-ray energies because of the strong variation with energy of the transmission coefficient for the crystals of the X-ray detectors. The X-rays are absorbed by the photoelectric process which has a strong energy dependence; (column 8, lines 13-44). The X-ray detectors may be crystals of zinc tungstate or cadmium tungstate in which event the X-ray photons are converted by the crystals into electromagnetic radiation in the visible range and the photons of visible light can be detected and quantified using a photo-electric sensor adapted to generate from the light emitted from the crystal an electric current which can be measured to give a numerical value proportional to the X-ray photon population incident on the appropriate crystal. As well known in the art of high energy photon detection (see for example Groom Fig. 24.1) the photon attenuation length for photons with energy up to 50 MeV is below 100 g/cm^2 and it is less than for photons with energy 5 MeV in a high atomic number Z material. Therefore design (thickness) of **rarer crystal** detector is enough for absorption and detection of photons with energy **up to 50 MeV**).

Neale does not necessarily teach the limitation that a first detector is "an array of fission-fragment detectors and the array of fission-fragment detectors is sensitive to

different ranges of photon beam energy" and "obtaining a first signal from the array of fission-fragment detectors, a second signal from the first set of scintillator paddles, and a third signal from the second set of scintillator paddles".

However, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include said limitation in view of Gunther et al. drawn to detection of photons with determined range of energy in the field of photofission fragment detection, hence analogous art, who teach to "applicability of a parallel plate avalanche detector to photofission detection (PPAD fission fragment detector) which can be used for high sensitive and selective detection of photons in photofission energy range and is insensitive to gamma background of photons with other energies (p. 462, column1, lines 8-29). Motivation for said inclusion derives from Gunther and Groom: because "Cross section of heavy nucleus photofission is large for photons with the energy of photofission range above ~5 MeV, (see cross section of photofission σ_{nucl} in Fig. 24.3,) and this is useful for increase an efficiency of said photons detection and fission fragment detectors are insensitive to gamma background of photons with energies out of photofission range".

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include the teaching by Gunther and by Groom in the teaching by Neale to use photofission fragment detector for sellective registration of the photons in photofission energy range and this using can improve material discrimination.

There is a common knowledge a dependence on a material atomic number Z of the X-ray energy spectrum transformation after transmission X-ray through material with the different atomic numbers Z (disclosed by Groom, Fig. 24.1, 24.2, 24.3, 24.4, 24.5). There is a common knowledge that said spectrum transformation can be determined by X-ray energy spectrum registration with attenuating material and without attenuation material by known energy resolving X-ray detectors and photon detection in several energy ranges is enough for material Z identification (as disclosed by Neale). Some version of detectors sensitive for different ranges of X-ray energy spectrum is disclosed by Neale. It is obvious for ordinary skill in the art of radiation detection to use an available fission –fragment detector for detecting if photons in corresponded range of X-ray energy spectrum as disclosed by Gunter.

Motivation for said inclusion derives from Nealei who teaches: "Material discrimination arises from the energy dependence of the transmission coefficient being different for different materials.", column 8, lines 7+).

The claim would have been obvious because a person of ordinary skill has good reason to pursue the known options within his her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. The alleged distinction between the claimed "method for identifying fission material" of the invention and cited prior art does not correspond to any non-obvious claimed limitation.

On claim **2**, Neal teaches: said identifying comprises determining a range atomic number of the material in a container (**Material discrimination** arises from the energy dependence of the transmission coefficient being different for different materials (abstract, column 8, lines 13-44), and determining the **mean number** Na of X-rays transmitted through a region thereof (in title, abstract, column 1, lines 18-67)).

On claim **3**, Gunther teaches: detecting the emerging photon beam from the material with the array of fission-fragment detectors comprises detecting an energy range of the emerging photon beam in a range between about 10 MeV to 20 MeV " is disclosed by (p. 462, column1, lines 11-29). Motivation for said inclusion derives from Gunther and Groom: because "Cross section of heavy nucleus photofission is large for photons with the energy of photofission range above ~5 MeV, (see photofission cross sections σ_{nucl} in Fig. 24.3) and this is useful for increase an efficiency and a sellectivity of said photons detection and because the fission fragment detectors are insensitive to gamma background of photons with energies out of photofission range".

On claim **6**, Neale teaches: detecting the emerging photon beam from the material with the first set of scintillator paddles comprises detecting an energy range of the emerging photon beam in a range up to about 6 MeV; "The transmitted X-rays are detected by **pairs of crystals** placed one behind the other the **front crystal** being sensitive to lower energy X-rays while the **rear crystal** is sensitive to higher energy X-rays, lower energy X-rays being filtered out using appropriate screens. Good

discrimination is possible at low X-ray energies because of the strong variation with energy of the transmission coefficient for the crystals of the X-ray detectors. The X-rays are absorbed by the photoelectric process which has a strong energy dependence" (Abstract, in FIG. 2, in FIG. 3, column 8, lines 13-44)).

On claim **7,** Neale teaches: detecting the emerging photon beam from the material with the second set of scintillator paddles comprises detecting an energy range of the emerging photon beam exceeding about 6 MeV; "The transmitted X-rays are detected by **pairs of crystals** placed one behind the other the **front crystal** being sensitive to lower energy X-rays while the **rear crystal** is sensitive to higher energy X-rays, lower energy X-rays being filtered out using appropriate screens. Good discrimination is possible at low X-ray energies because of the strong variation with energy of the transmission coefficient for the crystals of the X-ray detectors. The X-rays are absorbed by the photoelectric process which has a strong energy dependence"; (column 8, lines 13-44)).

On claim **9**, Neale teaches: creating a photon distribution energy curve using a combination of the first signal from the array array of energy selecting detector, the second signal from the first set of scintillator paddles, and the third signal from the second set of scintillator paddles; (in abstract, in FIG. 2, FIG. 3, Fig. 12, Fig. 13, "The transmitted X-rays are detected by **pairs of crystals** placed one behind the other the **front crystal** being sensitive to lower energy X-rays while the **rear crystal** is sensitive

to higher energy X-rays, lower energy X-rays being filtered out using appropriate screens. Good discrimination is possible at low X-ray energies because of the strong variation with energy of the transmission coefficient for the crystals of the X-ray detectors. The X-rays are absorbed by the photoelectric process which has a strong energy dependence; (column 8, lines 13-44)). FIG. 13 is a block schematic diagram of the signal processing stages of items 100 and 102 in FIG. 12 and the data processing and computation stage 104 of FIG. 12. Those elements making up each of the items of FIG. 12 are contained in outline boxes appropriately labeled with the corresponding reference numeral from FIG. 12 for ease of reference). Gunther teaches using the fission-fragment detector as energy selecting detector and use signal from this detector for detection og photin flux attenuation in said energy range (as delailed in rejection to claim 1).

On claim **28**, Neale teaches: casting an incident photon beam from the electron beam accelerator comprises directing an electron beam onto a radiator for producing a photon; "detector arrays being disposed respectively opposite **the accelerators;** Typically the source is a conventional 10 MeV electron linear accelerator with targets and beam hardeners to determine the X-ray spectrum emanating therefrom.", in abstract, Figs. 4, 5, 6,

On claim **29**, Neale and Groom teach: producing electron pairs with a converter coupled to the second set of scintillator paddles; "Each of the detectors is

made up of a target typically of tungsten (although any other dense high z material may be used) with two zinc tungstate crystals located on opposite sides thereof and positioned so as to receive photons of energy produced on the one hand predominately by electron-positron pair production (Neale: column 12, lines 61+). A probability of electron-positron pair conversion is high for photons with energy exceeding about 6 MeV (as shown in Fig. 24.2 of Groom)".

On claim **30**, Neale teaches: detecting an energy range of the electron pairs exceeding about 6 MeV (column 2, lines 53+); "Each of the detectors is made up of a target typically of tungsten (although any other dense high z material may be used) with two zinc tungstate crystals located on opposite sides thereof and positioned so as to receive photons of energy produced on the one hand predominately by **electron-positron pair** production; a lead plate will absorb the lower energy photons and transmit only the higher energy photons thereby ensuring that the second zinc tungstate detector only tends to receive energy attributable to electron-positron pair production and virtually none resulting from Compton scatter" (Neale: column n12, lines 61+). "A probability of electron-positron pair conversion is high for photons with energy exceeding about 6 MeV" (as shown in Fig. 24.2 of Groom).

On claim **31**, Neale teaches:" the array of energy resolving detectors including scintillating detectors: the first set of scintillator paddles is sensitive to a range of photon beam energy up to about 6 MeV, and the second set of scintillator paddles is sensitive

to a range of photon beam energy above about 6 MeV; (as shown in Fig. 3;column 10, lines 18+).

Neale does not necessary teach the limitation: the array of fission fragment detectors is sensitive to a range of photon beam energy between about 10 MeV and 20 MeV".

However, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include said limitation in view of Gunther et al. drawn to detection of photons with determined range of energy in the field of photofission fragment detection, hence analogous art, who teach to "applicability of a parallel plate avalanche detector to photofission detection (PPAD fission fragment detector) which can be used for high sensitive and selective detection of photons in photofission energy range and is insensitive to gamma background of photons with other energies (p. 462, column1, lines 8-29). Motivation for said inclusion derives from Gunther and Groom: because "Cross section of heavy nucleus photofission is large for photons with the energy of photofission range between about 10 MeV and 20 MeV,, (see cross section of photofission σ_{nucl} in Fig. 24.3,) and this is useful for increase an efficiency of said photons detection and fission fragment detectors are insensitive to gamma background of photons with energies out of photofission range".

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include the teaching by Gunther in the teaching by Neale to use photofission fragment detector for sellective registration of the photons in photofission energy range and this using can improve material discrimination.

It is obvious for ordinary skill in the art of radiation detection to use an available fission – fragment detector for detecting if photons in corresponded range of X-ray energy spectrum as disclosed by Gunter.

Motivation for said inclusion derives from Nealei who teaches: "Material discrimination arises from the energy dependence of the transmission coefficient being different for different materials", column 8, lines 7+).

The claim would have been obvious because a person of ordinary skill has good reason to pursue the known options within his her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. The alleged distinction between the claimed "method for identifying fission material" of the invention and cited prior art does not correspond to any non-obvious claimed limitation.

On claim **32**, Neale teaches: the first and second set of scintillator paddles comprise any scintillators transforming a high energy photon energy into low energy photons detectable by photosensors, including plastic scintillator paddles (column n11, lines 46+).

On claim **33**, Neale and Gunter teach (as detailed in rejection of claim 31): the array of fission fragment detectors, the first set of scintillator paddles, and the second set of scintillator paddles are sensitive to different, but overlapping ranges of photon beam energy.

Motivation for said inclusion derives from Nealei who teaches: "Material discrimination arises from the energy dependence of the transmission coefficient being different for different materials", column 8, lines 7+).

Conclusion

6. The following references are cited for disclosing related limitations of the applicant's claimed and disclosed invention:

Geus et al. U.S. Patent # 6,195, 413 B1

Cowan et al., Photonuclear fission from high energy electrons from ultraintense laser-solid interactions, Phy. Rev. Letters, 84(5), 903, 2000.

Duffield, The fission energy barrier, LA-1399, 1951.

Arrida et al., Detection of fissionfragments by parellel plate avalanche counter in the presece of an intense electron beam, Nuclear Instrum. Methods, 190 (1980), 203-205.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vadim Dudnikov whose telephone number is 571-270-1325. The examiner can normally be reached on 8:00 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Jack W. Keith can be reached, Mon-Fri 7:00am-4:00 pm, at telephone number 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Patent Examiner.

Vadim Dudnikov

November 8, 2007.

Primary Examiner:

(11/17/'07)

Johannes Mondt

(Art Unit 3663)